By L. B. Cebik, W4RNL

# A Homebrew, Light-Duty Metal Brake

## Tired of bending sheet metal over your knee? Try this!

Any ham who likes to build, usually has a need to bend sheet metal at one time or another. Nowadays, hams may not be making enclosures as often as they used to, but when the time arises that you need a custom-made box, you'd probably like it to look good—clean, even bends without cracks. If you've tried the oft-mentioned method of using a vise, two blocks of wood and a hammer to bend metal for your boxes and are tired of the less-than-satisfactory results, take a brake . . .

### The Why

When I needed a light-duty metal brake in a hurry, I built my own using shop scrap materials and standard hardware-store items. Because it's worked well for about eight years, I thought I'd pass on the construction details.

Bending aluminum and steel sheet with thicknesses up to about 18 gauge and sizes under 12 inches wide calls for a metal brake to apply even pressure all along the bent edge, with some care not to crease the metal so sharply that it cracks. A brake allows you to clamp the metal at the bend line, making allowance for the metal thickness and the radius of the bend.

### Building the Brake

Refer to Figures 1 through 5 to get an idea of the general assembly of the brake. To make your brake, you need four 6×1-inch steel mending bars (these are usually about $^1/_8$-inch thick), a pair of flat hinges about 2$^1/_2$ inches wide, some steel rod and some wood. A 10-minute raid on a hardware depot provided me with all the material I didn't already have in the shop. The hinges must be strong and the pin should completely fill the pin opening for wobbleless action. I used screen-door hinges. Get about three feet of $^3/_8$-inch-diameter steel rod to cut into two 18-inch-long lever-handles. About five feet of 1×4-inch (actually $^3/_4$-inch thick by 3$^1/_2$-inches wide) fir—or better wood—provides the plates and supports for the metal pieces. My hinge plates are about $^3/_{32}$ inch thick. Although the hinges come with their own hardware, the mending bars require $^3/_4$-inch-long wood screws to fit the countersunk holes. A 12-inch piece of $^1/_8$-inch thick, 1-inch-wide steel bar makes a good clamp.

When building your brake, you may need to make minor dimensional adjustments to suit your needs and the materials you use. The stationary plate—a 1×4 ripped in half—is made narrow to permit a pair of C clamps to easily grip the clamp bar and sheet metal to the mending bars and plate. The wider moving plate provides even pressure on the metal during the bend.

The key to installing the hinges is to be sure the center point of the pin aligns with two other dimensions: the surface of the mending bars and the junction between the

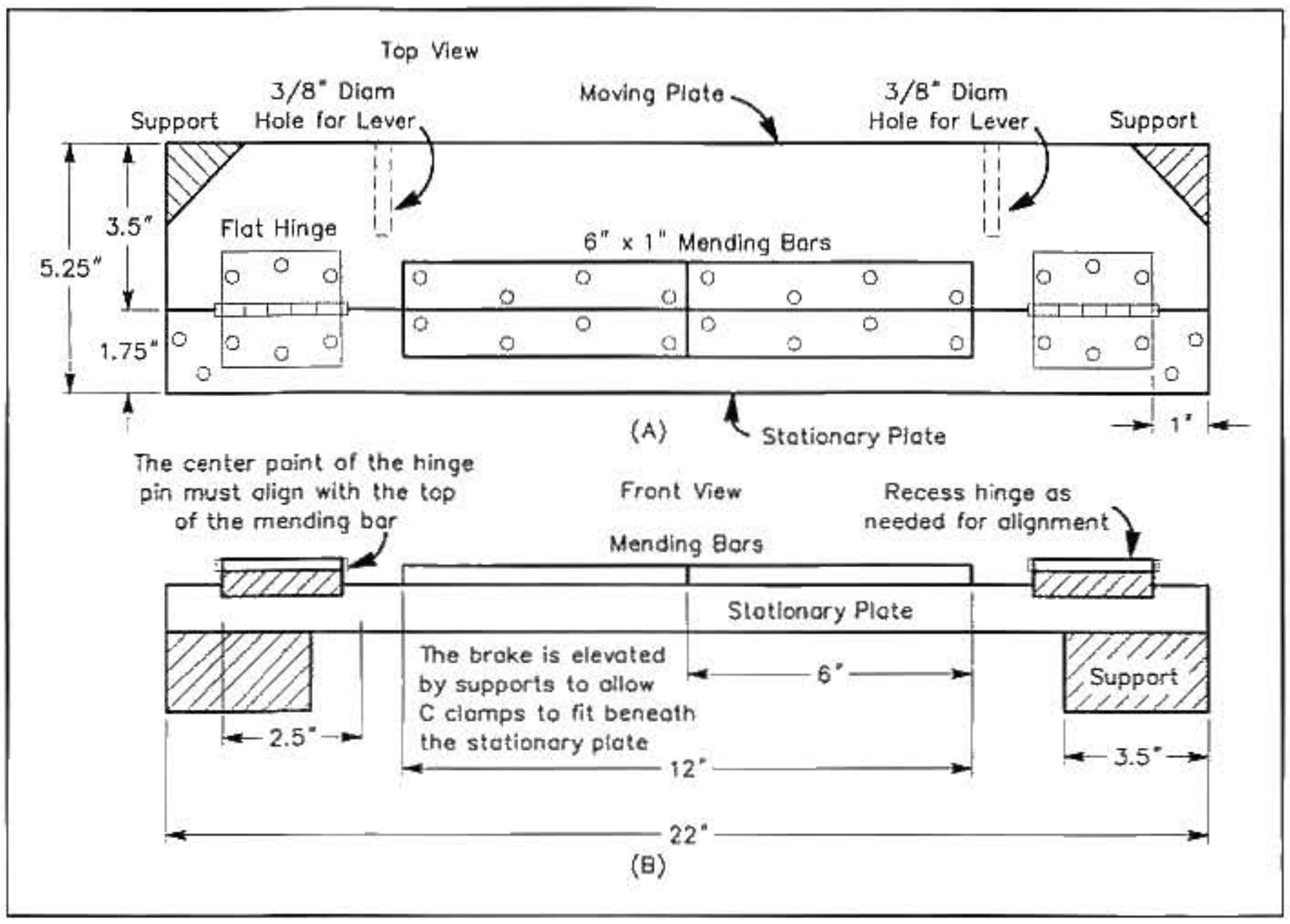


Figure 1—Top (A) and front (B) views of the homebrew metal brake. See Figure 2 for a side view of the assembly before and after a bend is made. Figures 3 through 5 are photos of my brake. The stationary and moving plates are made of 1×4-inch fir. Use 1×4 or 2×4 fir for the supports. You'll need #6 or #8×$^3/_4$-inch wood screws to secure the hardware.

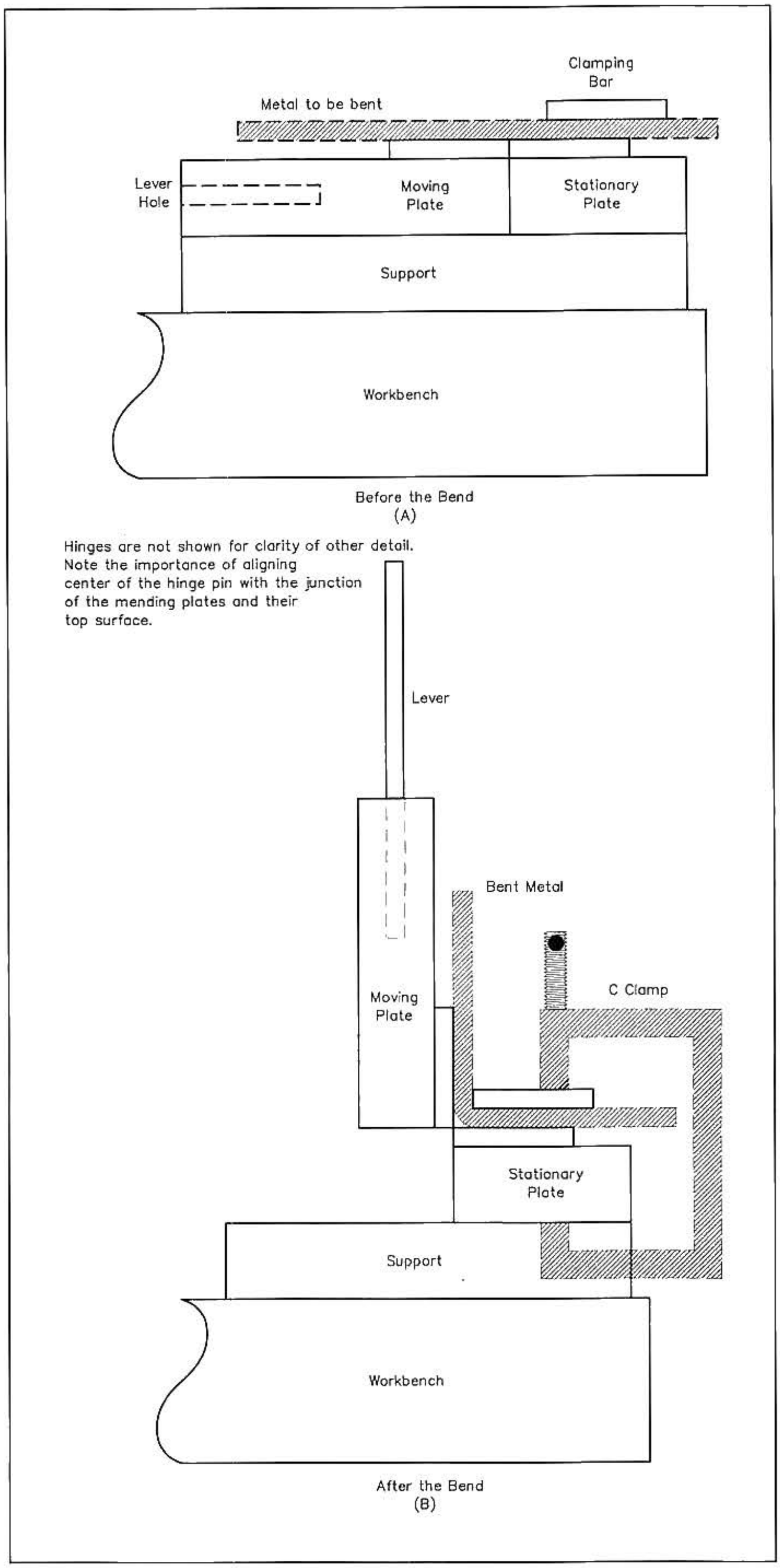


Figure 2—A side of the metal brake showing the position of the moving plate and metal before (A) and after (B) a 90° bend is made.

two wood plates. You may have to rout the wood plates to provide recesses for the hinges so that everything lines up correctly. This step requires the most care.

Typically, mending bars are cut or stamped so that one long edge is a bit more rounded than the other. Install the bars with the most-curved edges at the junction of the two wood plates. The slightly rounded edges help ensure a smooth rotation of the moving plate on the hinges. To protect the metal you're bending, remove any burrs from the mending plates. When mounting the four mending bars, be sure that the wood screws are a bit below the surface of the bars. After the strips are installed, remove any burrs from the screw slots.

The screws that secure the hinges and mending bars require carefully positioned small pilot holes to ensure that all parts are properly aligned. After making tiny pilot holes, enlarge them carefully, keeping your drill as vertical as possible. A drill press comes in handy here, but one isn't required if you have something vertical in the background to help you keep the bit aligned vertically while drilling.

The supports should be high enough to permit you to slide the fixed end of a pair of C clamps under the stationary plate. The support extends beyond the stationary plate to brace the moving plate when the unit is laid out flat in preparation for a job. The moving plate has wide-set $^3/_8$-inch-diameter holes in the edge (about 2 inches deep) to allow insertion of the steel-rod levers. You can fix the supports to your bench, or to a board that you clamp to the bench for occasional use.

## Putting the Brake to Work

Using the brake is a matter of careful set up, as shown in Figure 2. Use C clamps against the clamping bar and the bottom of the stationary plate to hold the work firmly. Set the clamp bar with enough space at the bend to give some room for the soon-to-be vertical section, plus a tiny amount to let the bend become a smooth, tight curve rather than a brittle pinch. Most hardware-store flat steel stock has slightly rounded edges. Place the most-rounded edge down against the bend to further ensure against creasing and weakening the bend.

When bending the metal sheet, apply smooth, even pressure by pulling the levers. You'll likely need to pull slightly more than 90° to get the metal to settle at a right angle. Each metal type and thickness requires a different amount of over-pull. Make a practice bend or two using scrap metal to get a feel for the material you're using.

## Summary

I've used my homebrew metal brake to fashion a range of items from small brackets that hold a coax connector to enclo-

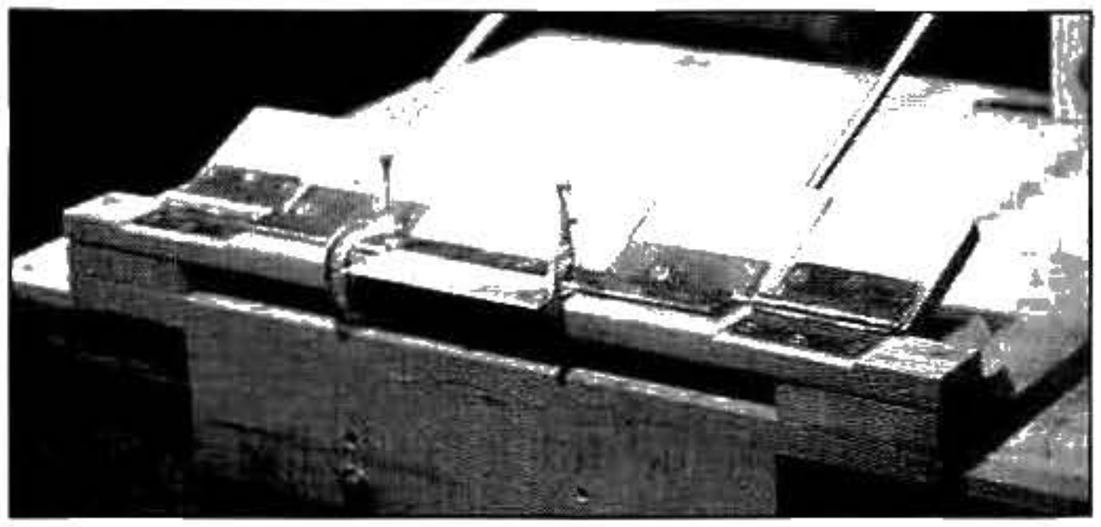

Figure 3—An overall view of the homebrew metal brake at work. Note the clamping of the aluminum sheet with steel bar and **C** clamps to ensure a straight bend all across the sheet. The rods on the movable plate of the brake exert considerable pressure with little operator effort. Pressure is distributed evenly by the movable plate (and the mending bars mounted on it). The brake is mounted to a pair of boards that permit clamping the brake to the workbench for secure operation. In my workshop, a number of "occasional-use" tools—including a disc-belt sander, a grinder and a miter box—are similarly mounted. A pair of 1/4×2-inch hex-head bolts secure the front board to **T** nuts installed in a back-up board on the front of the bench. Tool exchange is a two-minute operation.

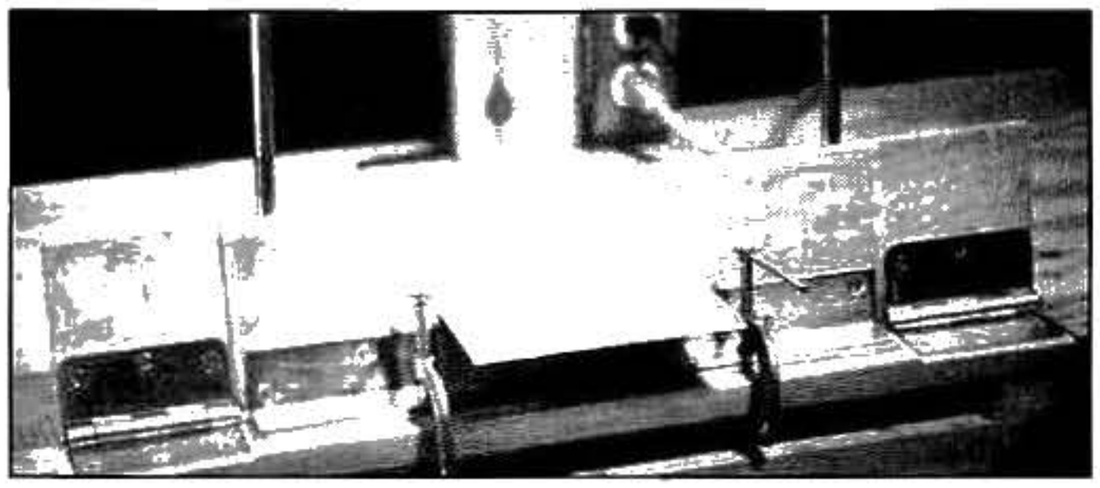

Figure 4—A close-up of the brake in action showing the placement of the mending bars and the clamping bar at the line of bend. The mending bars and their mounting screws should be free of burrs that might scratch the metal sheet. Keep the clamping bar and the mending bars clean and smooth. Avoid the use of coatings that might transfer to the work piece under the pressures of clamping and bending. For close double bends, you can modify the **C** clamp screws by cutting them short and redrilling them to accept the cross-rod. Spring clamps usually don't clamp the work tightly enough to avoid slippage.

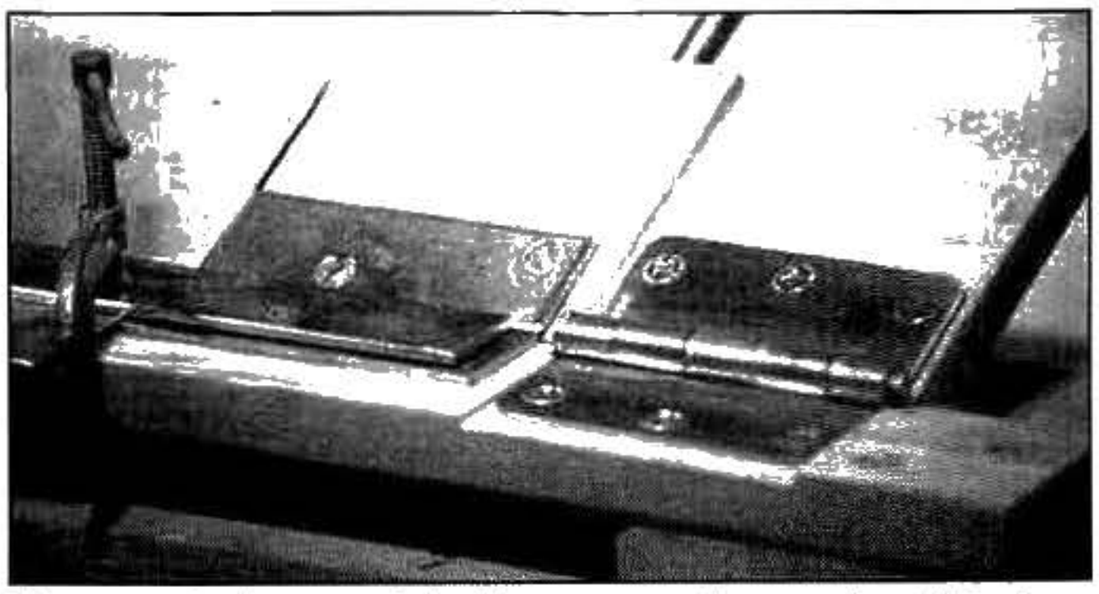

Figure 5—A close-up of the hinge-assembly mounting. Note the recesses in both the fixed and movable wood plates. To ensure a good bend, the center line of the hinge pin must align with the surface of the mending bars and the line of junction between the fixed and movable plates. The hinge recess depth depends on the type of hinge used. A router or a dado on a table saw can remove the necessary wood.

sures as large as 12×12×15 inches. Although I suspect the brake has a good bit of reserve strength. I've not used it to bend steel or aluminum thicker than 18 gauge. With the brake, you can form thin perforated and flashing aluminum with precise bends. All in all, I expect my metal brake to outlive me, as long as I keep the metal parts clean and rust-free!

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Photos by the author.

QST

# Strays

## GOLDEN ANTENNA AWARD

**The city of Bad Bentheim, Germany,** presents their Golden Antenna Award to a radio amateur each year, recognizing exceptional performance in humanitarian efforts. The 1995 award was presented to Erwin Muenz, DJ2AB, for his efforts toward the procurement, transportation, and distribution of medical supplies, food and consumer goods to people in Ukraine. Erwin (l) is shown here receiving the award from Bad Bentheim's Mayor Winkler.

## *QST* Congratulates...

◊ Tom Shaffer, NØHWY, who recently received his doctorate in educational leadership from the University of St Thomas, in St Paul, Minnesota. The high point of Tom's experience was having his father, Wayne, W3QAN, on hand to assist in the traditional academic ceremony. Tom is a principal in the Minneapolis Public Schools.